Remarks/Arguments

Amendments to the Claims

The Applicants have amended independent claim 12-13 and dependent claims 2-8 and 14-15. The Applicants have also canceled claims 9-10. The proposed amendments to the claims are supported by the as-filed specification and do not introduce new matter into this Application.

Independent claim 12 has been amended in a variety of ways. First, process steps have been added that call for "providing a metal plating system comprising a soluble anode that provides nickel ions to a plating solution and a cathode that provides a substrate to be deposited with the nickel ions" and "providing an aqueous rinse bath for washing the substrate after deposition of at least some of the nickel ions on the substrate." Support for these added process steps can be found page 1 lines 6-7, page 2 line 22 – page 3 line 2, page 3 lines 12-13, page 3 lines 15-24, Table 1 on page 4, page 4 lines 3-8 (the table on page 4 was ignored when identifying line numbers), and page 10 line 21 – page 11 line 2. Second, the process step calling for providing a waste metal plating stream has been rearranged to state that such a stream is provided "from the aqueous rinse bath" and contains "an aqueous solution that includes nickel ions that did not deposit onto the substrate." Support for these changes can be found on page 1 lines 10-11 and page 4 lines 3-8 (the Table on page 4 was ignored when identifying line numbers). Third, the electrochemical cell assembly has been further described as including a plurality of ceramic diaphragms that separate the anodes and cathodes. Support for this added limitation can be found on page 9 lines 4-9. Fourth, the cathodes of the electrochemical cell assembly have been further defined as being formed from sintered powder nickel. Support for this amendment can be found on page 2 lines 19-21, page 7 line 16 – page 8 line 2, page 9 lines 13-15, and page 9 line 25 – page 10 line 4. Fifth, the process step calling for using both the deposited nickel on the cathode and the cathode itself has been amended to state that those articles are used "as the soluble anode in the metal plating system to provide a source of the nickel ions to be deposited in a subsequent metal plating process." Support for this amendment can be found on page 3 lines 9-10 and page 10 lines 13-16. The other amendments to claim 12 seek to cure possible antecedent basis or clarity issues, or are simple rearrangements of language that was already present elsewhere in the claim 12.

Independent claim 13 has also been amended in a variety of ways. First, process steps have been added that call for "providing a metal plating system comprising a soluble anode that provides metal ions to a plating solution and a cathode that provides a substrate to be deposited with the metal ions" and "providing an aqueous rinse bath for washing the substrate after deposition of at least some of the metal ions on the substrate." Support for these added process steps can be found page 1 lines 6-7, page 2 line 22 – page 3 line 2, page 3 lines 12-13, page 3 lines 15-24, Table 1 on page 4, page 4 lines 3-8 (the table on page 4 was ignored when identifying line numbers), and page 10 line 21 – page 11 line 2. Second, the process step calling for providing a waste metal plating stream has been rearranged to state that such a stream is provided "from the aqueous rinse bath" and contains "an aqueous solution that includes metal ions that did not deposit onto the substrate." Support for these changes can be found on page 1 lines 10-11 and page 4 lines 3-8 (the Table on page 4 was ignored when identifying line numbers). And Finally, the electrochemical cell assembly has been further described as including a plurality of ceramic diaphragms that separate the anodes and cathodes. Support for this added limitation can be found on page 9 lines 4-9. The other amendments to claim 13 seek to cure possible antecedent basis or clarity issues, or are simple rearrangements of language that was already present elsewhere in the claim 13.

Dependent claim 2 has been amended to change its dependency to claim 13 (from claim 12) and to state that the metal ions contained in the waste metal plating stream comprise one of cadmium, cobalt, copper, lead, nickel, zinc, chromium, or precious metal ions or mixtures thereof. Support for these amendments can be found on page 3 lines 21-24, page 4 line 3 – page 5 line 2 (the table on page 4 was ignored when identifying line numbers), table 1 on page 4, and originally-filed claim 2.

Dependent claim 3 has been amended to change its dependency to claim 13 (from claim 12) and to state that the metal ions contained in the waste metal plating stream are nickel metal ions. Support for these amendments can be found on page 3 lines 21-24, page 4 line 3 – page 5 line 2 (the table on page 4 was ignored when identifying line numbers), table 1 on page 4, and originally-filed claim 3.

Dependent claim 4 has been amended to change its dependency to claim 13 (from claim 12) and to state that the metal ions contained in the waste metal plating stream are copper metal ions. Support for these amendments can be found on page 3 lines 21-24, page 4 line 3 – page 5

line 2 (the table on page 4 was ignored when identifying line numbers), table 1 on page 4, and originally-filed claim 4.

Dependent claim 5 has been amended to state that the cathodes are comprised of sintered powder nickel having a porosity of 5 to 100 pores/inch (PPI). Support for this amendment can be found on page 7 lines 16-21 and page 9 lines 13-17.

Dependent claim 6 has been amended to state that the waste metal plating stream has a nickel ion content of at least 200 g/liter. Support for this amendment can be found on page 9 lines 18-20 and originally-filed claim 6.

Dependent claim 7 has been amended to state that the waste metal plating stream is subjected to metal deposition and upon exiting the electrochemical cell assembly has a nickel ion content as low as 50 g/liter. Support for this amendment can be found on page 9 lines 20-24 and originally-filed claim 7.

Dependent claim 8 has been amended to state that the deposited nickel on the cathodes in the electrochemical cell assembly is fractured into pieces and is used as a source of the metal ions to be deposited in the subsequent metal plating process. Support for this amendment can be found on page 10 line 13 – page 11 line 5.

Dependent claim 14 has been amended to address some potential antecedent basis and clarity issues.

Dependent claim 15 has been amended to change its dependency to dependent claim 8 (from claim 12).

Claim Objections

Claims 2, 3, 9, and 10 have been objected to under 37 CFR 1.75(c) as being of improper dependent form. The Applicants, in this Response, have amended claims 2-3 so that they now depend from independent claim 13. The Applicants have also canceled claims 9-10. It is therefore respectfully requested that these objections be reconsidered and withdrawn.

Rejections under 35 USC 112

Claim 4 has been rejected under 35 USC 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which the Applicants consider as the invention. The Applicants, in this Response, have changed the dependency of claim 4 so that it now

depends from independent claim 13. This amendment should cure the 112 issue identified by the Examiner. The Applicants therefore respectfully request withdrawal of this rejection.

Rejections under 35 USC 103

A.

Claims 12, 15, 2-4, and 6-10 have been rejected under 35 USC 103(a) as being obvious over Kim et al. (US 4,445,990) in view of Kiyama et al. (US 5,573,652). The Applicants contend that these rejections should be withdrawn in light of the amendments to claim 12 and the arguments for patentability presented below. The Kim and Kiyama references, when considered individually or collectively, simply fail to render obvious the method of amended independent claim 12.

Amended independent claim 12 recites a method of recovering and using metal from a waste metal plating stream. The method includes providing a metal plating system comprising a soluble anode that provides nickel ions to a plating solution and a cathode that provides a substrate to be deposited with the nickel ions. The method also includes providing an aqueous rinse bath for washing the substrate and a waste metal plating stream from the aqueous rinse bath. The waste metal plating stream from the aqueous rinse bath contains an aqueous solution that includes nickel ions which did not deposit onto the substrate. The waste metal plating stream is passed into an electrochemical cell assembly having an inlet, a plurality of alternating anodes and cathodes porous to the waste metal plating stream, a plurality of ceramic diaphragms that separate the anodes and cathodes, and an exit. The cathodes provided in the electrochemical cell are formed from sintered powder nickel. The waste metal plating stream passes through the cathodes of the electrical cell assembly, and an electrical current passing through the anodes and the cathodes causes a portion of the nickel ions in the waste metal plating stream to deposit onto the cathodes. Upon exiting the electrochemical cell, the waste metal plating stream is recycled back to the aqueous rinse bath. The nickel deposited on the cathodes of the electrochemical cell assembly, and the cathodes themselves, are eventually used as the soluble anode in the described metal plating system as a source of nickel ions during a subsequent metal plating process.

The method of amended independent claim 12, as claimed, thus utilizes cathodes formed from sintered powder nickel to remove nickel ions from the waste metal plating stream. The fact that the cathodes in the electrochemical cell and the metal deposited on those cathodes from the

waste metal plating stream are the same material (nickel) makes it possible to use both the deposited nickel and the cathodes themselves in the metal plating system as soluble anodes that provide a source of nickel ions. The method of amended independent claim 12 also calls for separating the anodes and cathodes of the electrochemical cell assembly with ceramic diaphragms. These several claim limitations, when considered in the context of the entire claimed method, are not taught or suggested by the combined teachings of Kim and Kiyama.

The Kim reference discloses a method and apparatus for treating metal plating wastewater to remove heavy metals, toxic organic materials, chelating agents, and cyanide. *Kim: col. 1, lns. 6*-10. The Kim plating operation, as shown in Figure 1, includes a plating tank 10 that contains a plating solution 11 for electrochemically depositing a metal coating on a suitable workpiece. *Kim: col. 2, lns. 58-65*. After plating, the workpiece is transferred to a drag-out tank 12 in which the wastewater to be treated is located. *Kim: col. 2, lns. 58-66; and Figure 3*. This wastewater is passed through a reactor 20 that includes cathodes 44 and an anode 50. *Kim: col. 2 ln. 67 – col. 3 ln. 3; col. 3, lns. 52-53; col. 3, lns. 62-63; col. 3, lns. 48-56; and Figure 3*. The metals to be reclaimed are deposited on the cathodes 44, and the wastewater exiting the reactor 20 is returned to the drag-out tank 12. *Kim: col. 2 ln. 67 – col. 3 ln. 4*. The cathodes 44 contemplated by the Kim reference generally comprise a felt mass of conductive fibers. *Kim: abstract; col. 2, lns. 29-32; col. 3, lns. 62-63*. These fibers may comprise a variety of shredded or ribbon-like material – such as stainless steel wool or mild steel wool, bronze or copper wool, carbon ribbon, nickel wool, or iron wool – that is compressed into a felt mat. *Kim: col. 2 ln. 62 – col. 3 ln. 1; and col. 4, lns. 48-56*. The cathodes 44 may be separated from the anode 50 by a disc of porous filter paper 54 and a nonconductive screen 55 made from polypropylene. *Kim: col. 4, lns. 20-30; Figure 3*. The Kim reference further teaches that, at regular intervals, the cathodes 44 can be removed from the reactor 20 and the reclaimed metal either salvaged or returned to the plating bath 10. *Kim: col. 3, lns. 4-7*.

But nowhere does the Kim reference explicitly state or otherwise infer that the cathodes 44 could be formed from sintered powder nickel. The cathodes 44 described in the Kim reference, as stated before, comprise a felt mass of conductive fibers.

The Kim reference also fails to adequately disclose a plating operation in which the cathodes 44 are formed from the same material as the metal to be reclaimed (nickel in claim 12) so that both articles (reclaimed metal and the cathodes 44) can be used as soluble anodes to

provide a source of the same metal ion (again, nickel in claim 12) in a subsequent plating operation. The Kim reference offers no such concept anywhere in its disclosure, and arguably teaches away from doing so by describing four examples in which the reactor's 20 cathodes 44 and the metal reclaimed by the cathodes 44 are different. For instance, in Example 1, a steel wool cathode was used to remove copper from a wastewater stream. *Kim: col. 4, lns. 65-67; and col. 5, lns. 1-2.* In Example 2, a carbon fiber cathode was used to remove copper from a wastewater stream as well. *Kim: col. 5, lns. 20-25.* In Example 3, a carbon felt cathode was used to remove silver from a wastewater stream. *Kim: col. 5, lns. 54-61.* And in Example 4, a stainless steel wool cathode was used to remove copper from a wastewater stream. *Kim: col. 5, lns. 64-67.*

Still further, the Kim reference fails to adequately disclose the use of ceramic diaphragms to separate the cathodes 44 and anode 50 of its reactor 20. It is not seen how the disclosure of a porous filter paper disc 54 in combination with a nonconductive polypropylene screen 55 would prompt a skilled artisan to, first, select a ceramic diaphragm from the vast assortment of known nonconductive materials and, second, substitute it for the filter paper 54 and screen 55 located between the cathodes 44 and the anode 50 in the reactor 20. The Kim reference offers no guidance that would induce a skilled artisan to make such a substitution. Nor has the Examiner provided a sufficient reason for concluding that it would have been obvious to a skilled artisan to bridge the gap between the teachings of the Kim reference and the language in claim 12 calling for ceramic diaphragms. In fact, the Examiner's single-sentence explanation offered in support of why it would have been obvious to incorporate ceramic diaphragms into the Kim reactor 20 is nothing more than a generalized statement accompanied by no real factual details or deliberation. Such an analysis tends to suggest that the Examiner used the Applicants' disclosure as a blueprint to navigate the prior art and piece together the claimed invention while using a hindsight perspective to justify any resulting obviousness rejection. *See In re Shaffer*, 229 F.2d 476, 479, 108 USPQ 326, 329 (CCPA 1956) ("[I]t is not enough for a valid rejection to view the prior art in retrospect once an applicant's disclosure is known. The art applied should be viewed by itself to see if it fairly disclosed doing what an applicant has done."). A more definitive and explicit explanation on this issue is required if the Examiner wishes to maintain the obviousness rejection of claim 12. After all, rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational

underpinning to support the legal conclusion of obviousness. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418, 82 USPQ2d 1385, 1396 (2007) (citing *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006).

The Kiyama reference, moreover, cannot cure the deficiencies of the Kim reference discussed above. The Kiyama reference teaches an apparatus for continuously dissolving a metal powder for use in plating that avoids mixing the metal powder into the plating solution. *Kiyama: abstract; col. 1, lns. 9-14; col. 2, lns. 19-22.* The Kiyama reference also states that its teachings are focused on electroplating methods in which the anode located in the plating solution is nonsoluble. *Kiyama: col. 1, lns. 16-40.* Indeed, the whole point of utilizing the Kiyama apparatus to continuously dissolve a metal powder and introduce it into a plating solution is because soluble anodes that can otherwise provide those metal ions are not employed. *Kiyama: col. 1, lns. 16-40.* A skilled artisan would therefore not combine the teachings of the Kim and Kiyama references and reasonably be expected to arrive at the method of amended independent claim 12 which calls for, *inter alia*, a metal plating system comprising a soluble anode that provides nickel ions to a plating solution. Nor does the Kiyama reference utilize anything that resembles the reactor 20 disclosed in the Kim reference or the electrochemical cell assembly defined in the Applicants' claims.

The Applicants thus submit that the combined teachings of the Kim and Kiyama references fail to teach, suggest, or render obvious several limitations in claim 12 and their contextual relationship to one another. As such, a prima facie case of obviousness has not been established for amended independent claim 12. The same arguments also apply to dependent claims 15 and 6-8. Claims 2-4 now depend from claim 13 and claims 9-10 have been canceled.

The Applicants respectfully request that the rejections of claims 12, 15, and 6-8 over the Kim and Kiyama references be reconsidered and withdrawn.

B.

Claims 13-14 have been rejected under 35 USC 103(a) as being obvious over Kim (US 4,445,990) and Kiyama (US 5,573,652), as applied to claims 12, 15, 2-4, and 6-10, and further in view of Dickson (US 4,911,804). The Applicants contend that these rejections should be withdrawn in light of the amendments to claim 13 and the arguments for patentability presented

below. The Kim, Kiyama, and Dickson references, when considered individually or collectively, simply fail to render obvious the method of amended independent claim 13.

Amended independent claim 13 recites a method that includes providing a metal plating system comprising a soluble anode that provides metal ions to a plating solution and a cathode that provides a substrate to be deposited with the metal ions. The method also includes providing an aqueous rinse bath for washing the substrate and a waste metal plating stream from the aqueous rinse bath. The waste metal plating stream from the aqueous rinse bath contains an aqueous solution that includes metal ions which did not deposit onto the substrate. The waste metal plating stream is passed into an electrochemical cell assembly having an inlet, a plurality of alternating anodes and metallic cathodes porous to the waste metal plating stream, a plurality of ceramic diaphragms that separate the anodes and metallic cathodes, and an exit. The waste metal plating stream, while in the electrochemical cell assembly, passes through at least one of the metallic cathodes. An electrical current passing through the anodes and the cathodes causes a portion of the metal ions in the waste metal plating stream to deposit onto the at least one metallic cathode. The at least one metallic cathode is then removed from the electrochemical cell assembly, and the deposited portion of the metal ions is recovered by fracturing the deposited portion into pieces to provide fractured recovered portions. The fractured recovered portions are then used in the metal plating system as a source of the metal ions to be deposited in a subsequent metal plating process. The at least one metallic cathode from which the fractured recovered portions of the metal ions were obtained is then reintroduced to the electrochemical cell assembly to continue removing metal ions from the waste metal plating stream.

The method of amended independent claim 13, as claimed, thus calls for recovering the deposited portion of the meal ions from the metallic cathode, using the fractured recovered portions of the deposited metal ions in the metal plating system as a source of metal ions, and reintroducing the metallic cathode back into the electrochemical cell where it can continue removing metal ions from the waste metal plating stream. The method of amended independent claim 13 also calls for separating the anodes and metallic cathodes of the electrochemical cell assembly with ceramic diaphragms. These several claim limitations, when considered in the context of the entire claimed method, are not taught or suggested by the combined teachings of Kim, Kiyama, and Dickson.

The relevant teachings of Kim and Kiyama have already been discussed above and are applicable here. The Applicants' arguments pertaining to the ceramic diaphragm are likewise applicable here. That is, the Examiner has simply not provided a sufficient reason for concluding that it would have been obvious to a skilled artisan to substitute ceramic diaphragms, as called for in claim 13, for the filter paper disc 54 and the nonconductive polypropylene screen 55 in the reactor 20 described by the Kim reference. Also applicable here is the Applicants' argument that a skilled artisan would have no reason to combine the teachings of the Kim and Kiyama references and reasonably be expected to arrive at the method of amended independent claim 13 which calls for, *inter alia*, a metal plating system comprising a soluble anode that provides metal ions to a plating solution. This is because the Kiyama reference teaches an apparatus for continuously dissolving metal powder and introducing it into a plating solution where soluble anodes are not employed. The Kiyama apparatus also does not use anything that resembles the reactor 20 disclosed in the Kim reference or the electrochemical cell defined in the Applicants' claims.

Moreover, the Dickson reference does not actually disclose the reintroduction of a metallic cathode into an electrochemical cell assembly after recovery of a deposited portion of metal ions from the cathode as set forth in the method of claim 13. Rather, the Dickson references teaches that a cathode with a heavy metal electrodeposited thereon may be removed from one electrochemical cell 100 and introduced into another electrochemical cell 140 as an anode without first removing the electrodeposited heavy metal. *Dickson: abstract; col. 7, lns. 10-14.* The heavy metal is recovered in sheet form only after the cathode from one electrochemical cell 100 is incorporated, without removal of the deposited heavy metal, as an anode in a different electrochemical cell 140. *Dickson: abstract; col. 7, lns. 10-14.* The teachings in the Dickson reference would therefore not encourage a skilled artisan to modify the Kim reference by removing the deposited metal from the cathode 44 and then reintroducing the cathode 44 back into the reactor 20, as suggested by the Examiner.

The Applicants thus submit that the combined teachings of the Kim, Kiyama, and Dickson references fail to teach, suggest, or render obvious several limitations in claim 13 and their contextual relationship to one another. As such, a prima facie case of obviousness has not been established for amended independent claim 13. The same arguments also apply to dependent claims 14 and 2-4.

The Applicants respectfully request that the rejections of claims 13-14 over the Kim, Kiyama, and Dickson references be reconsidered and withdrawn.

C.

Claim 5 has been rejected under 35 USC 103(a) as being obvious over Kim (US 4,445,990) and Kiyama (US 5,573,652), as applied to claims 12, 15, 2-4, and 6-10, and further in view of Carlson (US 3,650,925). The Applicants respectfully request that the rejection of claim 5 be reconsidered and withdrawn in view of the amendments made to independent claim 12 and the accompanying arguments for patentability presented in this Response.

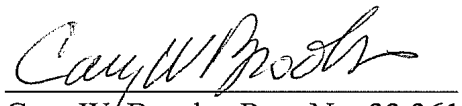
Conclusion

The Applicants respectfully request reconsideration and withdrawal of the claim objections, the indefinite rejections, and the obvious rejections raised in the Office Action mailed August 03, 2009. The Applicants also respectfully request allowance of claims 12-15 and 2-8

The Examiner is invited to telephone the Applicant's undersigned attorney at (248) 689-3500 if any unresolved matters remain in connection with this correspondence.

Applicants' counsel authorizes the Commissioner to charge any deficiencies or credit any overpayments associated with this correspondence to Deposit Account No. 50-0852.

Respectfully Submitted,



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